

Abstract of the Disclosure

A showerhead diffuser apparatus for a CVD process has a first channel region having first plural independent radially-concentric channels and individual gas supply
5 ports from a first side of the apparatus to individual ones of the first channels, a second channel region having second plural independent radially-concentric channels and a pattern of diffusion passages from the second channels to a second side of the apparatus, and a transition region between the first channel region and the second channel region having at least one transition gas passage for communicating gas from each first channel
10 in the first region to a corresponding second channel in the second region. The showerhead apparatus has a vacuum seal interface for mounting the showerhead apparatus to a CVD reactor chamber such that the first side and supply ports face away from the reactor chamber and the second side and the patterns of diffusion passages from the second channels open into the reactor chamber. In preferred embodiments the supply
15 ports, transition passages, and diffusion passages into the chamber do not align, and there is a special plasma-quenching ring in each of the second channels preventing plasma ignition within the channels in the showerhead. methods and systems using the showerhead are also taught.